

# ***IAFWA Research Update on the Target Animal Safety of Chloramine-T to cool- and warmwater fish***

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# *Assumptions*

- Walleye and channel catfish selected as representative sensitive species based on hydrogen peroxide target animal safety
- Fry are generally more sensitive than fingerlings
- Chloramine-T is more toxic as exposure temperature increases
- Chloramine-T is more toxic in soft, acidic water

# *Toxicity Assessment*

- Standard Treatment Regimen
  - 60-min exposures of 20 mg/L administered once daily on four consecutive days
- Assess acute toxicity to fry
  - Coolwater: walleye, northern pike, lake sturgeon
  - Warmwater: channel catfish and largemouth bass
- Gross necropsies / histopathology
- Feeding behavior

# *Toxicity Assessment*

- Walleye and channel catfish were used to assess
  - temperature
    - WAE - 15, 20, or 25°C
    - CCF - 22, 27, 32°C
  - exposure duration: 60 or 180 min
  - life stage: fry vs. fingerling
  - alkalinity and hardness: walleye only
  - histopathology

# *Methods*

- Chloramine-T concentrations - 0, 20, 60, 100, or 200 mg/L
- Four consecutive, once daily exposures followed by a 96 h observation period
- Concentrations – Hach DPD method
- 15 L glass aquaria
- Aquaria were flushed for 60 min following each exposure
- Feeding behavior
- Gross necropsies

## *Methods*

- Alkalinity and hardness
  - 1 L glass aquaria, 3 fish per aquaria, 6 aquaria per concentration
  - ASTM reconstituted soft water
    - Alkalinity = 30-35 mg/L  $\text{CaCO}_3$
    - Hardness = 40-48 mg/L  $\text{CaCO}_3$
- Histopathology screening
  - 0, 20, 50, and 80 mg/L
  - 80 L fiberglass tanks, 36 fish per tank
  - 12 consecutive, once daily 180 min exposures
  - Fish necropsied after 12<sup>th</sup> exposure, then 7 and 14 d after the last exposure

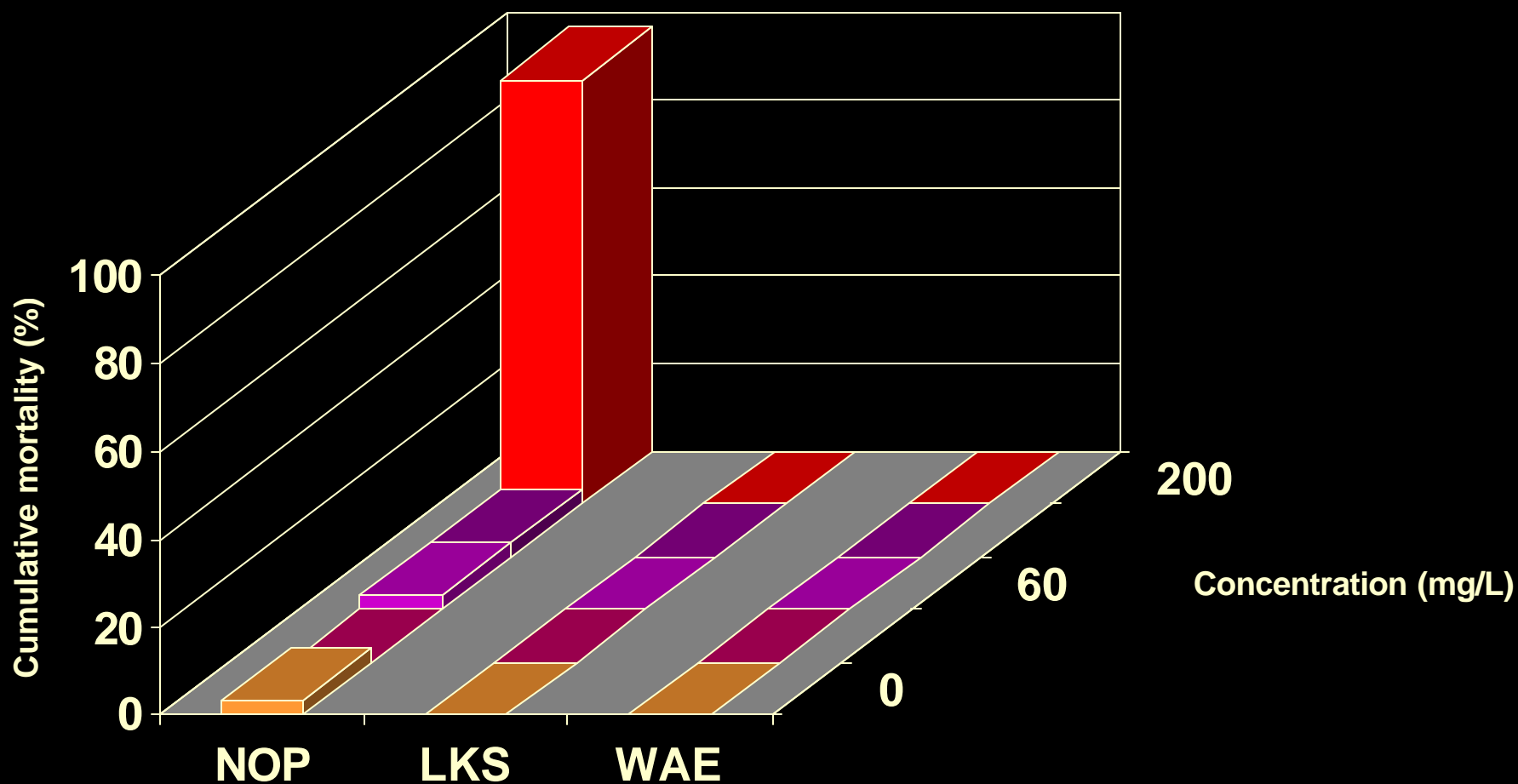


Walleye fry during  
CI-T exposure.



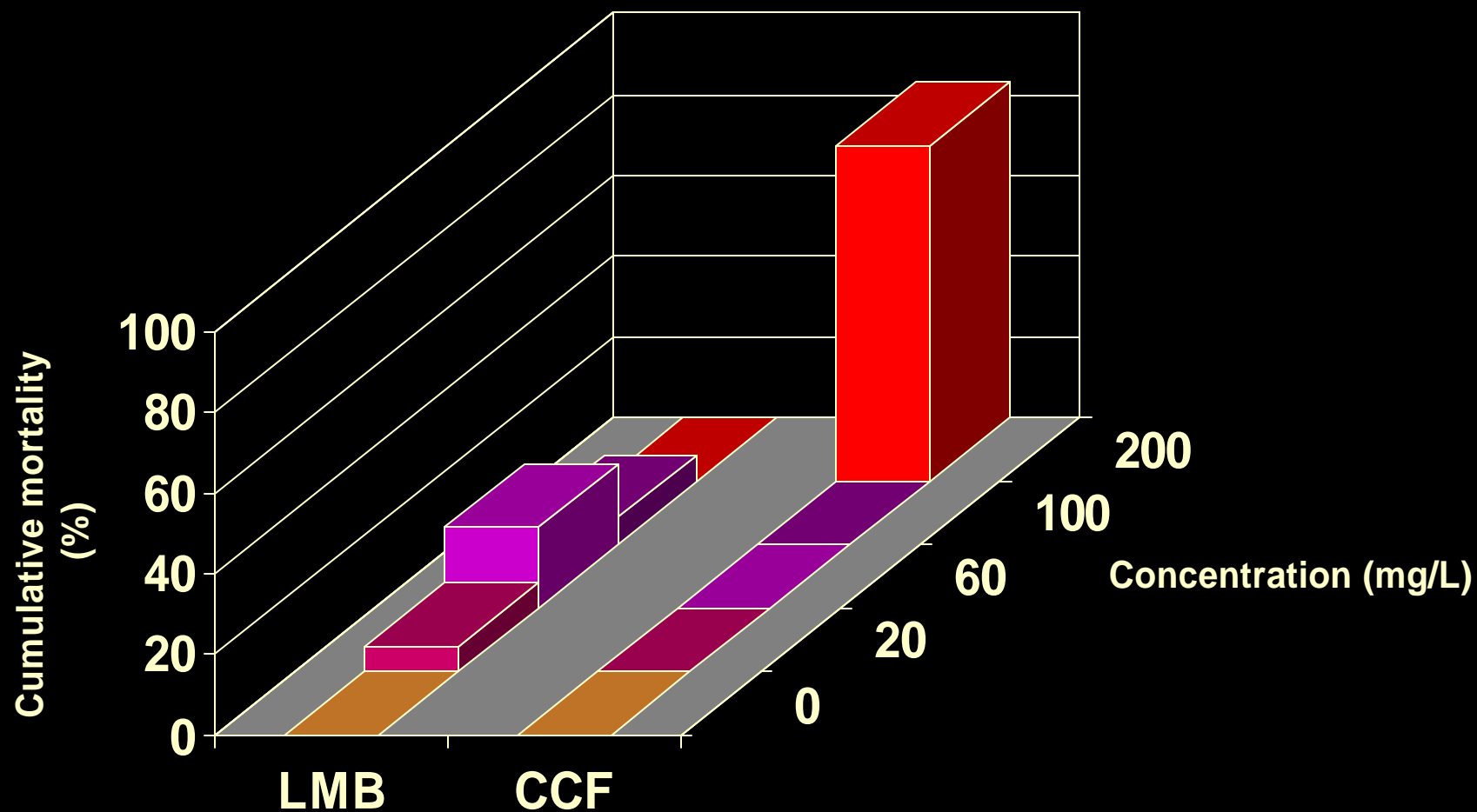
Necropsy of walleye fry  
after CI-T exposure.

# *Mortality of coolwater fry exposed to Cl-T*

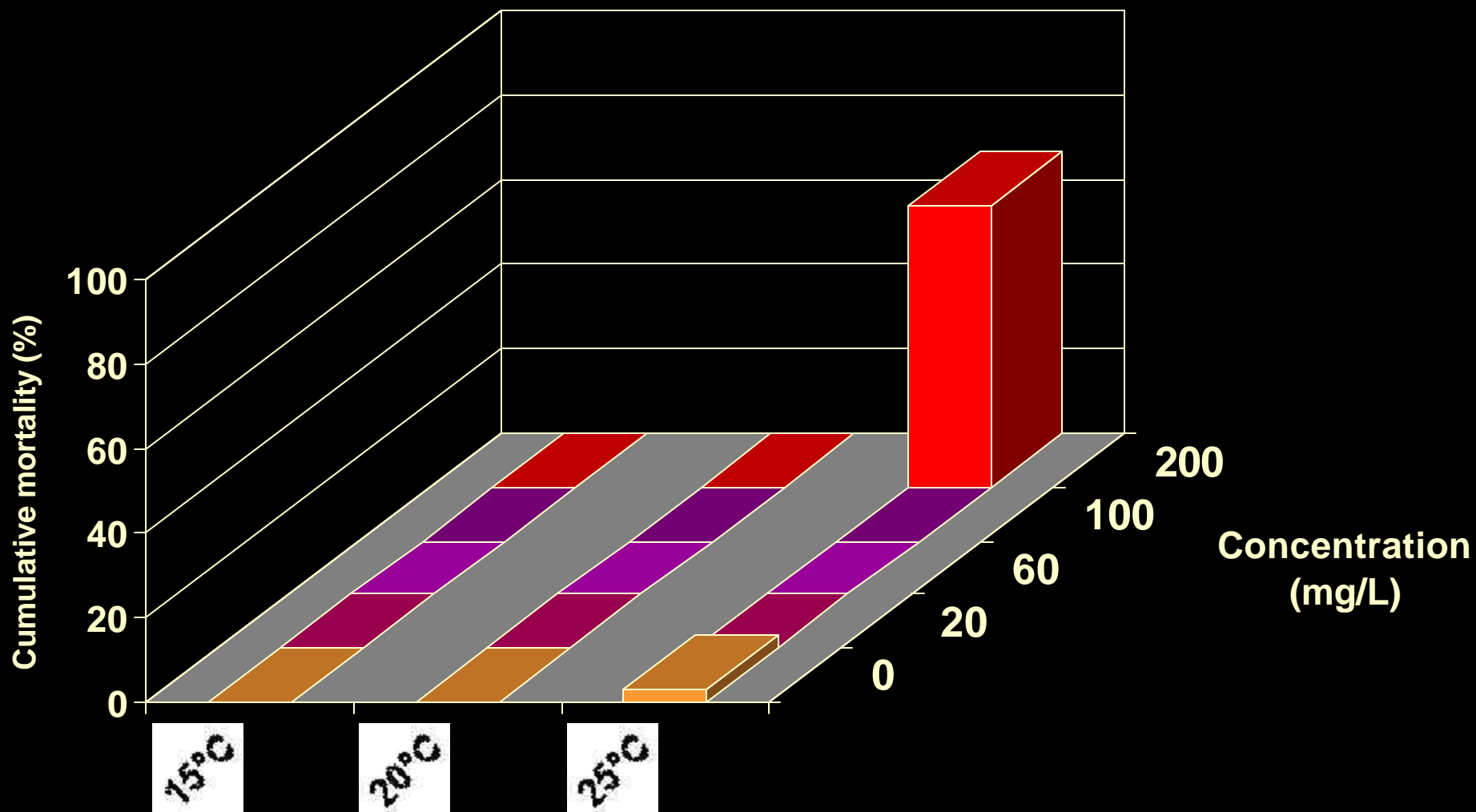




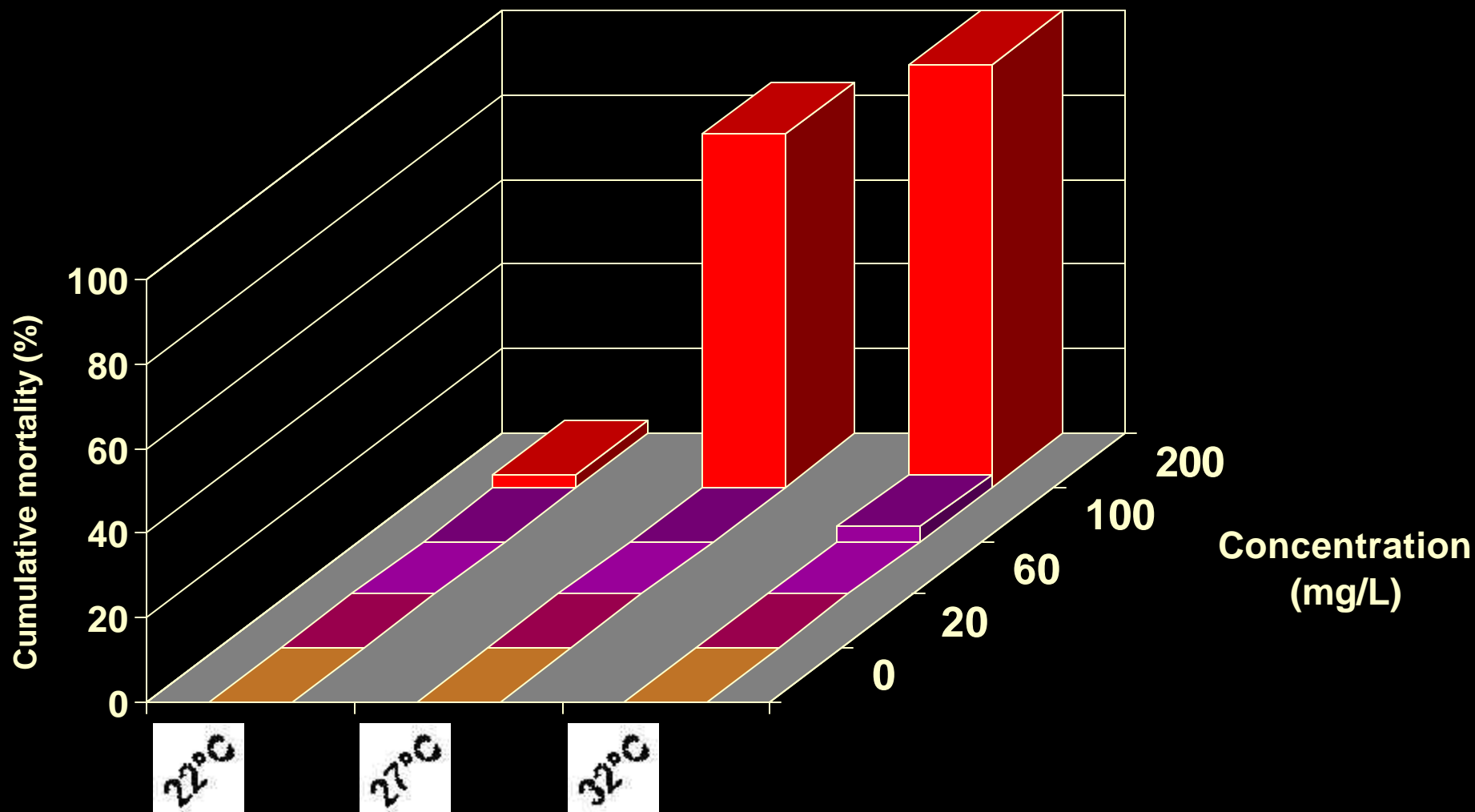
# *Mortality of warmwater fry exposed to Cl-T*



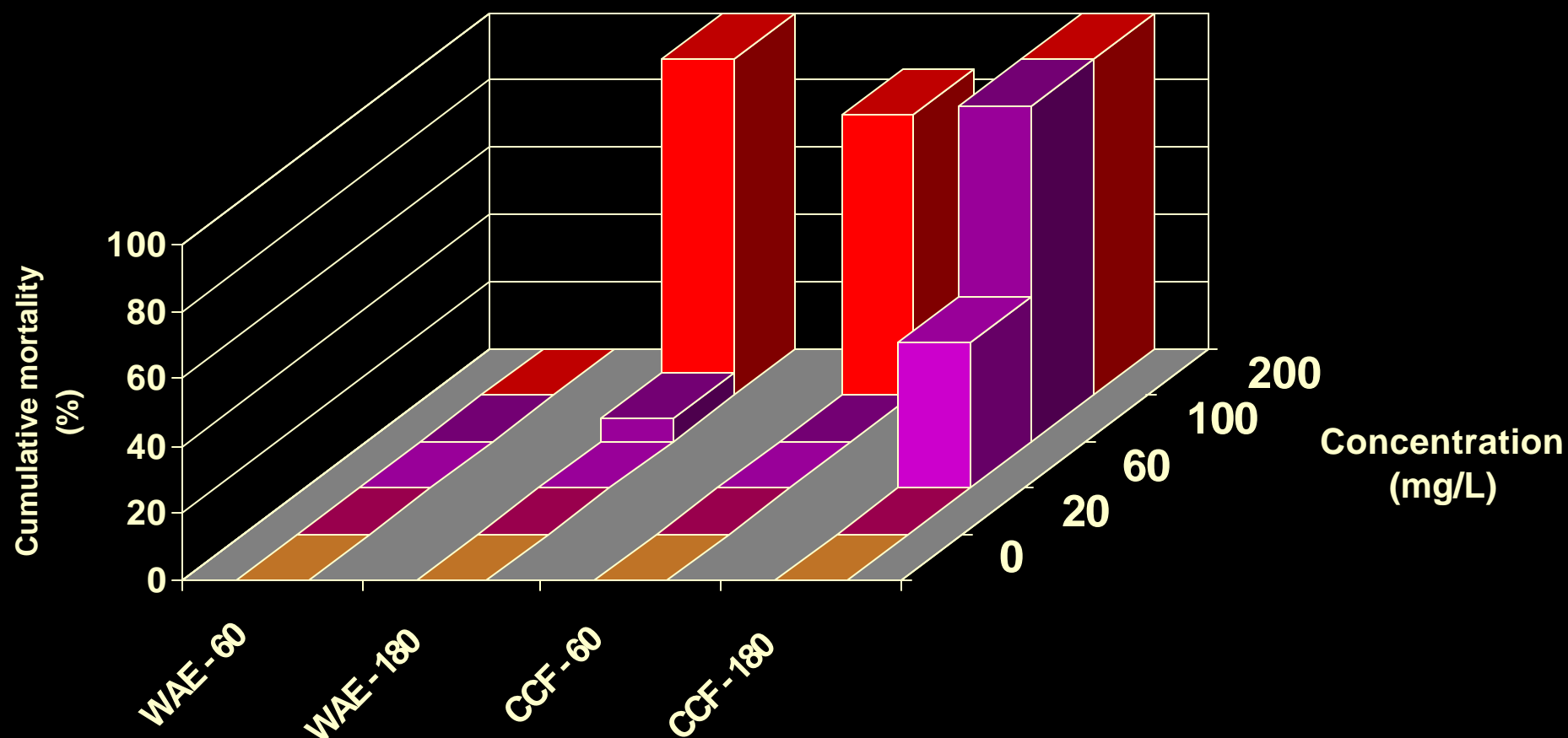
# *Effect of temperature on the toxicity of Cl-T to walleye fry*



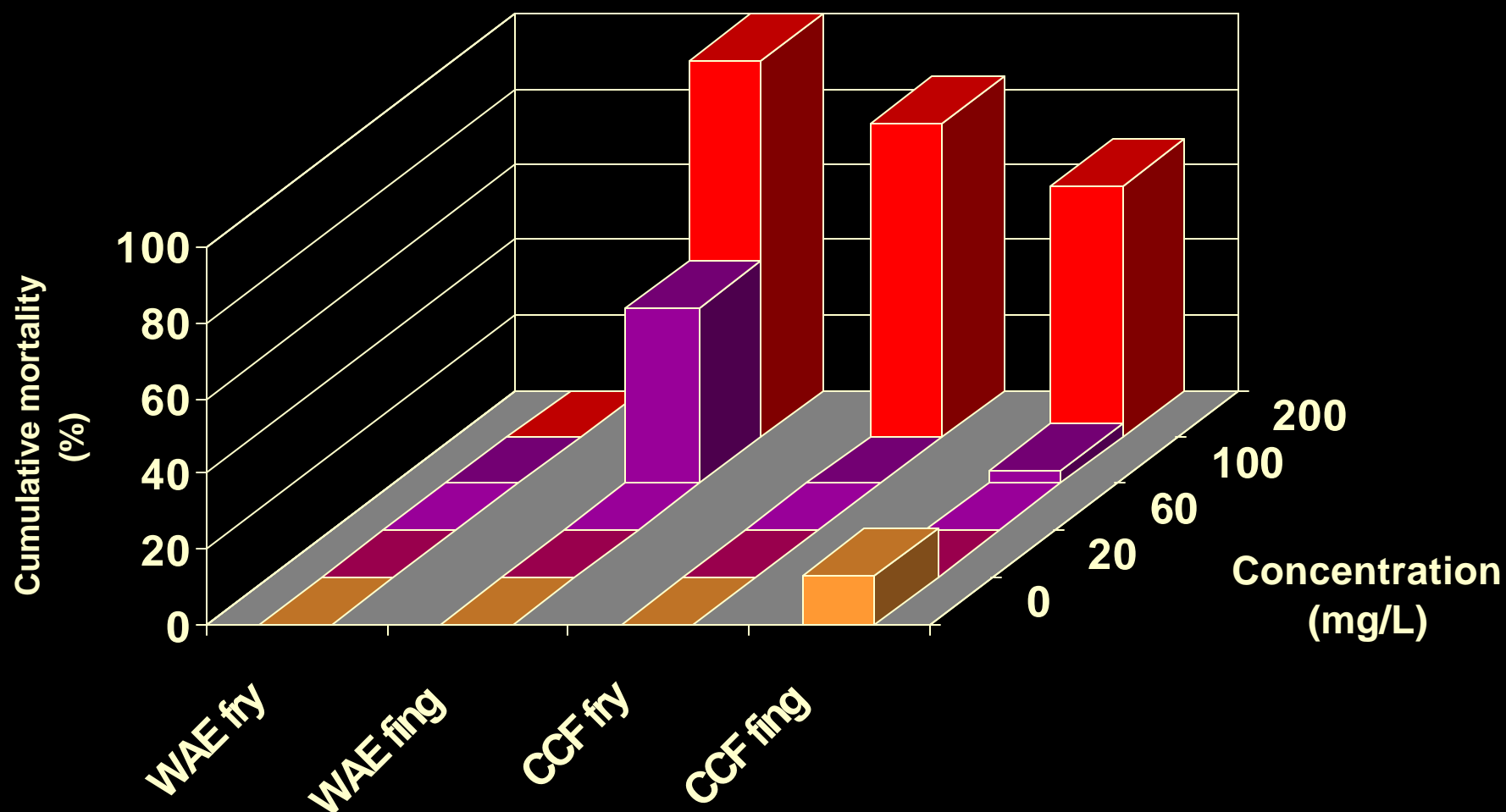
# *Effect of temperature on the toxicity of Cl-T to channel catfish fry*



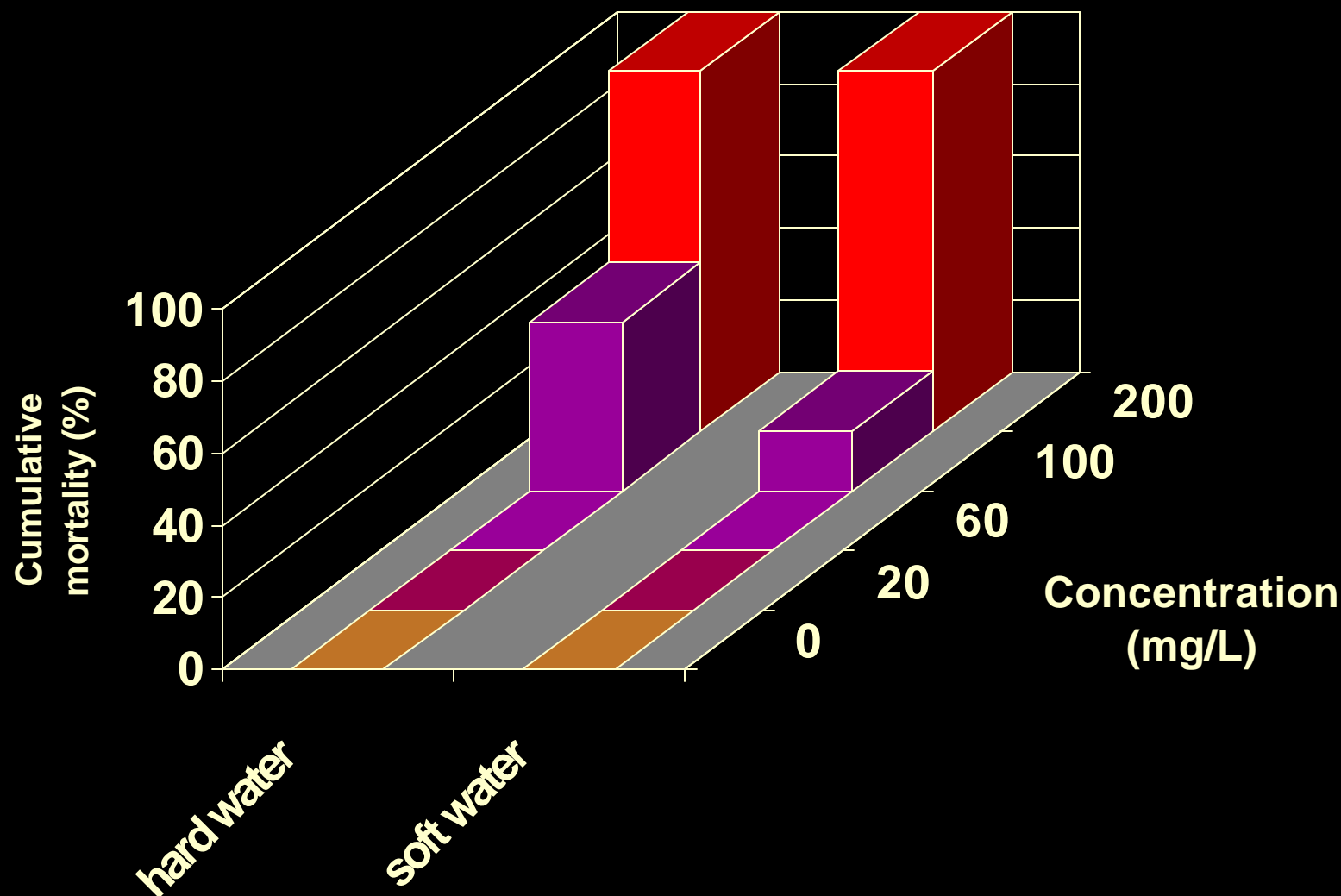
# *Effect of exposure duration on the toxicity of Cl-T to fry*



# *Effect of life stage on the toxicity of Cl-T*



# *Effect of water chemistry on the toxicity of Cl-T*



# *Gross necropsy and feeding behavior*

- Pale gills in dead fish following treatment
- Pale translucent livers in northern pike that died following 200 mg/L treatment
- Feeding of walleye and channel catfish reduced by 100 and 200 mg/L treatment



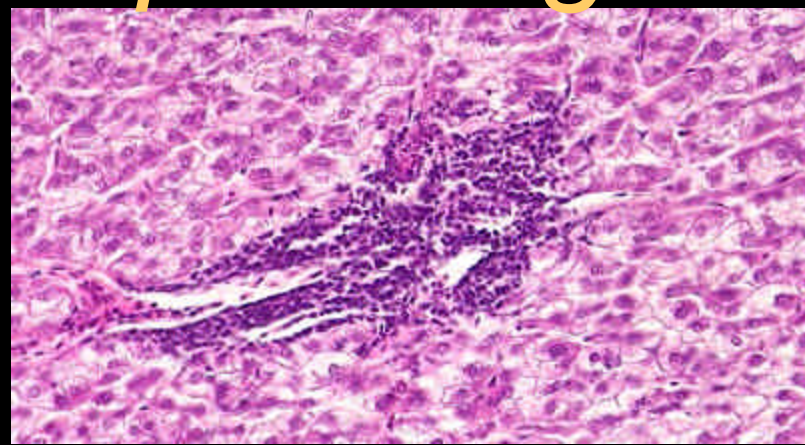
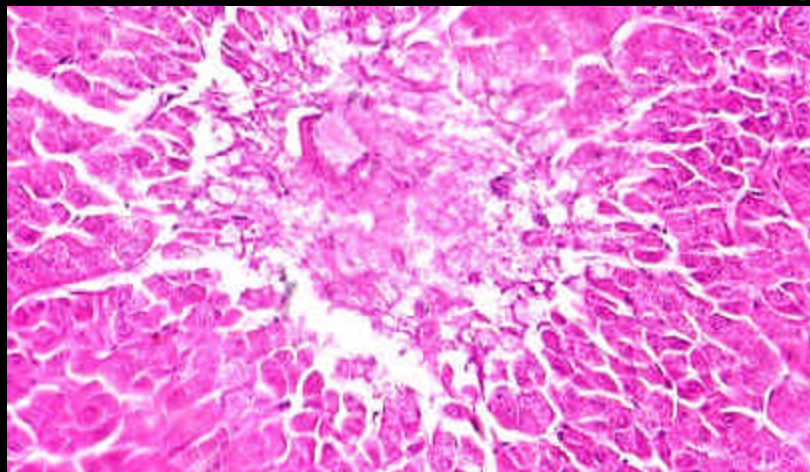
# *Histopathology screen*

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- A background image showing two panels of histopathology slides. The left panel shows a cross-section of tissue, possibly gills, with a blue stain. The right panel shows a more complex, branching tissue structure, also stained blue.
- Eye
  - Skin
  - Liver
  - Spleen
  - Blood cytology
  - Gills
  - Changes:
    - Growth
    - Inflammatory
    - Degenerative
  - Extent
  - Severity



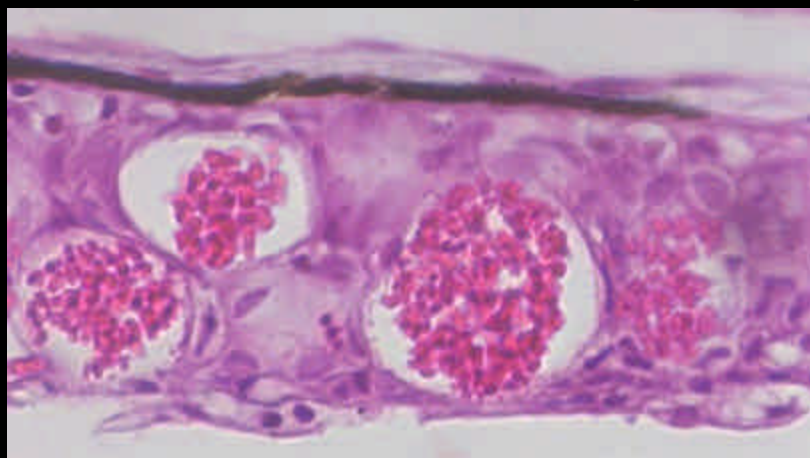
# *Walleye treatment pathologies*

**Hepatocellular necrosis – 20 mg/L**



**Lymphocyte aggregate – 80 mg/L**

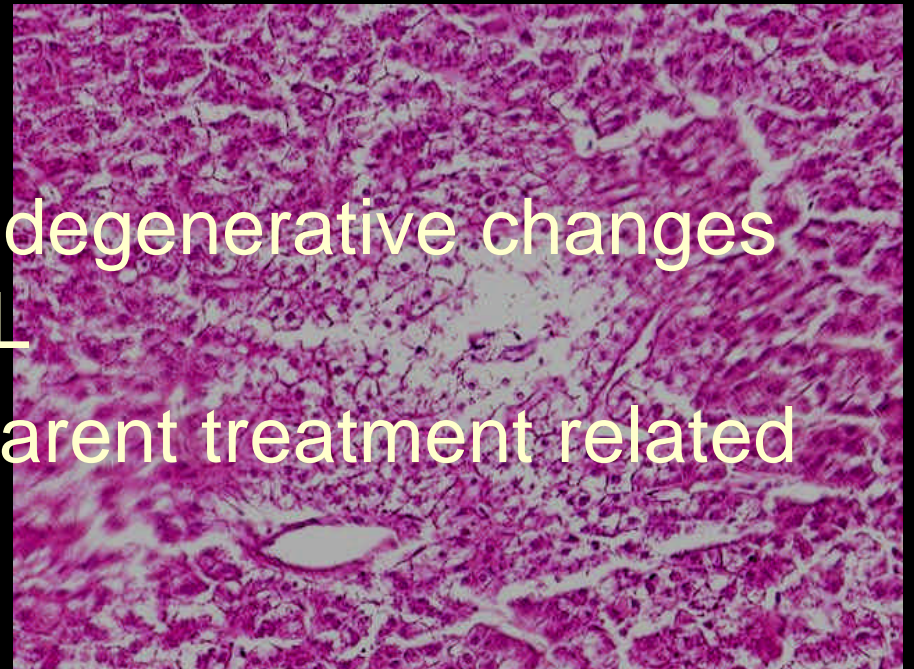
**Skin epithelial and EGC hyperplasia – 50 mg/L**



**Skin normal epithelia – 50 mg/L**

# *Treatment Pathologies*

- Pathologists were unaware of treatment concentration for all slides except blood cytology
- Effects?
  - Spleen –increase in degenerative changes in walleye at 80 mg/L
  - No other readily apparent treatment related pathologies



Hepatocellular necrosis in walleye





## *Summary*

**A therapy of four consecutive, once daily chloramine-T treatments of 20 mg/L for 60 min is safe for cool- and warmwater fish.**